

**RAPTOR  
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## NOTES, NEWS, AND QUERIES

**Publication Plans for 1972.** *Raptor Research News* will undergo further evolution. The changes are designed to make it a more acceptable journal for the publication of high quality research papers while retaining features of informality in information exchange. The following changes are being instituted:

1. Change in title to *Raptor Research*; the volume numbers will be consecutive with those of its predecessor.

2. Changes in format: increased page size, more generous margins, trimmed edges, cover, mailing in an envelope, availability of reprint orders.

3. Change to quarterly: the amount of material will be greater but the reduced frequency will increase the probability of regular undelayed appearance. Publication dates will be the last days of February, May, August, and November. Papers should be in the hands of one of the editors about two months before publication.

4. Articles of opinion or ideas and reports of various sorts will be separated from research papers.

**New Editor of Raptor Research.** We are happy to announce the appointment of the new Editor, Dr. Richard R. Olendorff, 3317 Olympus Dr., Bremerton, Washington 98310. Dr. Olendorff, who is currently on a post-doctoral fellowship with the American Museum of Natural History, completed his Ph.D. at Colorado State University. He has done considerable work on raptors and is the author of our Report No. 1 and compiler of an important bibliography. Byron E. Harrell and Donald V. Hunter, Jr. will continue as Associate Editors. Material for *Raptor Research* may be sent to any of the Editors.

**Special Conference on Captivity Breeding of Birds of Prey.** On November 22 and 23, 1971 Raptor Research Foundation sponsored this conference which was held at Sioux Falls, South Dakota. Over 80 persons attended, coming from many

states and provinces. It was enormously stimulating and from all reports was considered highly successful.

Because of the great interest an extended report is planned. A transcript is well along in preparation and edited sections of the ten panels will be issued as they are completed as a supplement to *Raptor Research*.

**Raptor Research Abstracts.** The *Abstracts* will be initiated quarterly beginning in March. More details will appear in the double issue of the *News* now in press.

**NOTICE. Conference on Raptor Conservation Techniques.** The Raptor Research Foundation in cooperation with the Department of Fishery and Wildlife Biology, Colorado State University, is sponsoring a symposium on the status of wild populations and on captivity breeding of birds of prey, to be held at Fort Collins, Colorado, 17-20 November 1972. Papers on the following topics are invited: Population inventories, Productivity studies, Investigations of the effects of biocides and industrial wastes (PCB's) on raptor populations, Population management and conservation, and Captivity breeding of raptors by individuals, academic institutions and zoological gardens. The scope of the conference is worldwide and contributions from abroad are expected. Anyone wishing to present a paper or to attend should contact Dr. Richard R. Olendorff, 3317 Olympus Drive, Bremerton, Washington 98310 U.S.A., or Dr. Byron E. Harrell, Raptor Research Foundation, Inc., c/o Biology Department, University of South Dakota, Vermillion, South Dakota 57069 U.S.A. The deadline for submitting abstracts is October 15, 1972.

**Marked Ospreys.** Persons sighting Ospreys with a yellow plastic jess attached to the left leg should notify Donald R. Johnson, Department of Biology, University of Idaho, Moscow, Idaho 83843, specifying date and location of sightings. Fifteen nestling Ospreys were so marked during the past nesting season on Lakes Coeur d'Alene and Pend Oreille in northern Idaho in an effort to determine the time and route of migration in these populations.

# ESTIMATIONS RELATIVE TO BIRDS OF PREY IN CAPTIVITY IN THE UNITED STATES OF AMERICA

by  
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**Introduction.** Counts relating to birds of prey in captivity have been accomplished in some European countries; however, to the knowledge of this author no such information is available in the United States of America. The following paper consists of data related to this subject collected during 1969-1970 from surveys carried out in many different directions within this country.

**Methods.** In an attempt to obtain as clear a picture as possible, counts were divided into specific areas: Research, Zoological, Falconry, and Pet Holders. It became obvious as the project advanced that in some cases there was overlap from one area to another; an example of this being a falconer working with a bird both for falconry and research purposes. In some instances such as this, the author has used his own judgment in placing birds in specific categories; in other instances received information has been used for this purpose.

It has also become clear during this project that a count of "pets" is very difficult to obtain. Lack of interest, non-cooperation, or no available information from animal sales firms makes the task very difficult, as unfortunately, to obtain a clear dispersal picture it is from such sources that information must be gleaned. However, data related to the importation of birds of prey as recorded by the Bureau of Sport Fisheries and Wildlife is included, and it is felt some observations can be made from these figures.

Within the specific areas used for count purposes, the following methods were utilized:

*Research*—Surveys were sent to a total of one hundred and five universities, government agencies, and private organizations. Of this total, seventy-one replies were received. Thirty-

seven were in the affirmative, but the number of persons holding raptors exceeds this number, it representing mainly agencies and organizations in which individuals are either employed or are members.

*Zoological Societies*—Surveys were sent to one hundred and sixty-two public and private zoological societies. One hundred and fifteen replies were received of which ninety-one were in the affirmative.

*Falconry*—Birds held for falconry purposes are quite difficult to gauge. Figures used in this count were obtained from state agencies and private organizations expressing interest in birds of prey. The difficulty of a count lies not so much in total numbers as species held. Therefore, over-all numbers will be considered in opposition to individual species. In other returns specific numbers were not given, but answers were phrased, “small, medium, or large.” Interpretation of such answers rests entirely with the author.

**Counts—Birds of Prey in Captivity—Research and Zoological.** The following section tabulates results of counts from surveys. Names for the Order Falconiformes are taken from *Eagles, Hawks and Falcons of the World* by Leslie Brown and Dean Amadon, and those for the Order Strigiformes from *Birds of Prey of the World* by Mary Louise Grossman and John Hamlet.

## ORDER FALCONIFORMES

## Research Zoos

### Family Cathartidae

Cathartes aura	Turkey Vulture	7	43
Cathartes burrovianus	Yellow-headed Vulture		5
Coragyps atratus	Black Vulture	3	35
Sarcorhamphus papa	King Vulture		53
Gymnogyps	California Condor		1
californianus			
Vultur gryphus	Andean Condor	9	41

### Family Pandionidae

Pandion haliaetus	Osprey		3
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## Family Accipitridae

Elanus leucurus	White-tailed Kite		1
Elanus caeruleus	Black-shouldered Kite		1
Rostrhamus sociabilis	Snail/Everglade Kite	11	2
Ictinia mississippiensis	Mississippi Kite		3
Milvus migrans	Black/Pariah Kite		5
Milvus milvus	Red Kite		1
Haliastur sphenurus	Whistling Eagle		3
Haliastur indus	White-headed Sea Eagle		17
Haleaeetus leucogaster	White-bellied Sea Eagle		8
Haliaeetus vocifer	African Fish Eagle		9
Haliaeetus leucoryphus	Pallas' Sea Eagle		5
Haliaeetus leucocephalus	Bald Eagle	30	102
Haliaeetus albicilla	White-tailed Sea Eagle		3
Haliaeetus pelagicus	Steller's Sea Eagle		4
Ichthyophaga	Grey-headed		3
ichthyaetus	Fishing Eagle		
Gypohierax angolensis	Vulturine Fish Eagle		6
Neophron percnopterus	Egyptian Vulture		32
Gypaetus barbatus	Lammergeier		2
Necrosyrtes monachus	Hooded Vulture		2
Gyps bengalensis	Indian White-backed Vulture		2
Gyps africanus	African White-backed Vulture		2
Gyps himalayensis	Himalayan Griffon		1
Gyps fulvus	Griffon Vulture		14
Sarcogyps calvus	Indian Black Vulture		8
Aegypius monachus	Cinereous Vulture		13
Trigonoceps occipitalis	White-headed Vulture		2
Terathopius ecaudatus	Bateleur	4	3
Spilornis cheela	Crested Serpent Eagle		12
Geranospiza caerulescens	Crane Hawk		6
Circus cyaneus	Marsh Hawk		7
Melierax canorus	Pale Chanting Goshawk		2
Accipiter gentilis	Northern Goshawk	4	3
Accipiter striatus	Sharp-shinned Hawk		2
Accipiter fasciatus	Australian Goshawk		2
Accipiter badius	Shikra	12	2
Accipiter cooperii	Cooper's Hawk		7

Leucopternis semitumbea	Semiplumbeous Hawk		2
Leucopternis albicollis	White Hawk		3
Buteogallus anthracinus	Common Black Hawk		1
Buteogallus urubitinga	Great Black Hawk		5
Harpyhaliaetus solitarius	Black Solitary Eagle		1
Heterospizias meridionalis	Savannah Hawk		19
Geranoaetus melanoleucus	Grey Eagle-buzzard		4
Parabuteo unicinctus	Harris's Hawk	7	21
Buteo nitidus	Grey Hawk		4
Buteo magnirostris	Roadside Hawk		3
Buteo lineatus	Red-shouldered Hawk	11	9
Buteo platypterus	Broad-winged Hawk	6	7
Buteo brachyurus	Short-tailed Hawk		3
Buteo swainsonii	Swainson's Hawk	9	19
Buteo solitarius	Hawaiian Hawk		4
Buteo ventralis	Red-tailed Buzzard		11
Buteo jamaicensis	Red-tailed Hawk	41	155
Buteo lagopus	Rough-legged Buzzard		9
Buteo rufinus	Long-legged Buzzard		1
Buteo regalis	Ferruginous Hawk	2	24
Buteo auguralis	African Red-tailed Buzzard		3
Morphnus guianensis	Guiana Crested Eagle		7
Harpia harpyja	Harpy Eagle		17
Harpyopsis novaeguineae	New Guinea Harpy Eagle		1
Pithecophaga jefferyi	Philippine Monkey- eating Eagle		8
Aquila rapax	Tawny/Steppe Eagle	1	5
Aquila heliaca	Imperial Eagle	2	5
Aquila wahlbergi	Wahlberg's Eagle		2
Aquila chrysaetos	Golden Eagle	24	173
Aquila audax	Wedge-tailed Eagle		14
Aquila verreauxi	Verreaux's Eagle	1	
Hieraaetus fasciatus	African Hawk-eagle	5	2
Hieraaetus pennatus	Booted Eagle		2
Hieraaetus morphnoides	Little Eagle		1
Spizastur melanoleucus	Black and White Hawk-eagle		1
Lophoaetus occipitalis	Long-crested Eagle		1

Spizaetus cirrhatus	Changeable Hawk-eagle		4
Spizaetus tyrannus	Black Hawk-eagle	1	2
Spizaetus ornatus	Ornate Hawk-eagle		5
Stephanoaetus coronatus	Crowned Eagle		3
Polemaetus bellicosus	Martial Eagle		4

### Family Sagittariidae

Sagittarius serpentarius	Secretary Bird		32
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### Family Falconidae

Daptrius ater	Yellow-throated Caracara		4
Phalcoboenus megaloptyerus	Mountain Caracara		3
Polyborus plancus	Common Caracara		55
Milvago chimachima	Yellow-headed Caracara		3
Micrastur semitorquatus	Collared Forest Falcon	2	3
Microhierax caerulescens	Red-legged Falconet	9	14
Falco sparverius	American Kestrel	127	59
Falco chicquera	Red-headed Falcon	2	5
Falco columbarius	Merlin	22	2
Falco berigora	Brown Hawk		1
Falco rufigularis	Bat Falcon		2
Falco biarmicus	Lanner Falcon	6	
Falco mexicanus	Prairie Falcon	18	4
Falco cherrug	Saker Falcon	4	
Falco rusticolus	Gyr Falcon	16	
Falco deiroleucus	Orange-breasted Falcon		2
Falco peregrinus	Peregrine Falcon	114	2
TOTALS		510	1,234

**Falconry.** As was stated in the introduction, state agencies have been the source of much information pertaining to falconry. A figure of raptors in possession for falconry purposes is difficult to arrive at; however on information supplied, it is estimated that it is approximately 1200-1300 broken down as follows:



State Returns of Raptors Held for Falconry 1969/70

Alabama	1	Montana	5
Alaska	8	Nebraska	2
Arizona	23	New Mexico	4
California	450	Nevada	10
Colorado	70	North Dakota	5
Florida	25	Oklahoma	6
Georgia	2	Oregon	14
Idaho	18	Pennsylvania	59
Illinois	50	Rhode Island	1
Indiana	35	South Dakota	10
Iowa	11	South Carolina	8
Kansas	20	Texas	15
Kentucky	20	Utah	12
Louisiana	4	Virginia	30
Maryland	40	Washington	90
Michigan	25	Wisconsin	40
Minnesota	35	Wyoming	50
Mississippi	2		
Missouri	25	TOTAL	1,225

Percentage of Species Held in Relation to Total Numbers 1969/70. These are based on over-all average of states providing actual species counts.

Genus Buteo/ Parabuteo	Red-tailed Hawk, Ferruginous Hawk, Swainson's Hawk, Harris's Hawk, Rough-legged Hawk	58%
Genus Accipiter	Goshawk, Cooper's Hawk, Sharp-shinned Hawk, etc.	13%
Genus Falco	Kestrels, Merlins, Prairie Falcon, Peregrine Falcon, Gyrfalcon, Saker Falcon, Lanner Falcon, Lugger Falcon	28%
Others		1%
	TOTAL	100%

## Order STRIGIFORMES

## Research Zoos

## Family Tytonidae

Tyto alba	Barn Owl	14	72
Phodilus badius	Bay Owl		4

## Family Strigidae

Otus asio	Common Screech Owl	26	77
Otus choliba	Tropical Screech Owl		2
Otus watsonii	Tawny-bellied Screech Owl		2
Lophotrix cristata	Crested Owl		2
Bubo virginianus	Great Horned Owl	14	180
Bubo bubo	Eagle-owl		12
Bubo nipalensis	Forest Eagle-owl		2
Ketupa ketupa	Malay Fish Owl		8
Ketupa zeylonensis	Brown Fish Owl		3
Pulsatrix perspicillata	Spectacled Owl		7
Pulsatrix koeniswaldiana	White-chinned Owl		3
Nyctea scandiaca	Snowy Owl	6	45
Glaucidium brasilianum	Ferruginous Pigmy Owl		3
Glaucidium gnoma	Northern Pigmy Owl		6
Glaucidium cuculoides	Cuckoo Owlet		2
Micrathene whitneyi	Elf Owl		14
Ninox novaeseelandiae	Spotted Hawk Owl		2
Athene noctua	Little Owl		5
Speotyto cunicularia	Burrowing Owl	30	47
Ciccaba virgata	Mottled Owl		3
Ciccaba huhula	Black-banded Owl		2
Strix varia	Barred Owl	4	39
Strix nebulosa	Great Grey Owl		4
Strix aluco	Tawny Owl		6
Strix leptogrammica	Brown Wood Owl		3
Rhinoptynx clamator	Striped Owl		5
Asio otus	Long-eared Owl		4
Asio flammeus	Short-eared Owl		14
Aegolius acadicus	Saw-whet Owl		16
	TOTALS	94	594

## Falconry.

Bubo virginianus	Great Horned Owl	7
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## Birds of Prey Held for Research, Zoological and Falconry Purposes

Falconiformes			
Research	510	17.17%	
Zoological	1,234	41.56%	
Falconry	1,225	41.25%	
			2,969
Strigiformes			
Research	94	13.52%	
Zoological	594	85.47%	
Falconry	7	1.00%	
			695
Final Total			3,664

## Birds of Prey Imported into the United States 1968/69

### Order FALCONIFORMES

Family Cathartidae		1968	1969
Sarcorhamphus papa	King Vulture	28	25
Vultur gryphus	Andean Condor	8	5

### Family Accipitridae

Henicopernis longicauda	Long-tailed Honey-buzzard	25	
Elanus leucurus	White-tailed Kite		1
Elanus caeruleus	Black-shouldered Kite		8
Ictinia plumbea	Plumbeous Kite		3
Haliastur indus	White-headed Sea Eagle	14	10
Haliaeetus vocifer	African Fish Eagle	2	
Ichthyophaga nana	Lesser Fishing Eagle	1	4
Gypohierax angolensis	Vulturine Fish Eagle	2	
Neophron percnopterus	Egyptian Vulture	11	9
Gyps bengalensis	Indian White-backed Vulture		2
Gyps indicus	Indian Griffon		5
Gyps fulvus	Griffon Vulture		4
Aegypius monachus	Cinereous Vulture	4	5
Trigonoceps occipitalis	White-headed Vulture		2
Circaetus gallicus	Serpent Eagle	1	3
Terathopius ecaudatus	Bateleur	3	24

<i>Spilornis cheela</i>	Crested Serpent Eagle	5	10
<i>Geranospiza caerulescens</i>	Crane Hawk		4
<i>Circus cyaneus</i>	Marsh Hawk	2	80
<i>Accipiter gentilis</i>	Northern Goshawk	21	22
<i>Accipiter nisus</i>	European Sparrow-hawk		3
<i>Accipiter tachiro</i>	African Goshawk		10
<i>Accipiter trivirgatus</i>	Crested Goshawk		3
<i>Accipiter badius</i>	Shikra	30	126
<i>Accipiter superciliosus</i>	Tiny Sparrow-hawk	1	1
<i>Accipiter bicolor</i>	Bicoloured Sparrow-hawk	3	4
<i>Butastur teesa</i>	White-eyed Buzzard	6	67
<i>Kaupifalco monogrammicus</i>	Lizard Buzzard	1	
<i>Leucopternis albicollis</i>	White Hawk	2	6
<i>Buteogallus anthracinus</i>	Common Black Hawk	1	6
<i>Heterospizias meridionalis</i>	Savannah Hawk	1	6
<i>Buteo magnirostris</i>	Roadside Hawk	44	175
<i>Buteo poecilochrous</i>	Gurney's Buzzard		7
<i>Buteo jamaicensis</i>	Red-tailed Hawk	6	8
<i>Morphnus guianensis</i>	Guiana Crested Eagle	1	
<i>Harpia harpyja</i>	Harpy Eagle	1	4
<i>Aquila clanga</i>	Greater Spotted Eagle	6	2
<i>Aquila rapax</i>	Tawny/Steppe Eagle	16	28
<i>Aquila heliaca</i>	Imperial Eagle	1	
<i>Aquila chrysaetos</i>	Golden Eagle	2	
<i>Aquila verreauxi</i>	Verreaux's Eagle	1	
<i>Hieraaetus fasciatus</i>	African Hawk-eagle	1	3
<i>Spizaetus cirrhatus</i>	Changeable Hawk-eagle	7	8
<i>Spizaetus nipalensis</i>	Mountain Hawk-eagle	3	11
<i>Spizaetus tyrannus</i>	Black Hawk-eagle		2
<i>Spizaetus ornatus</i>	Ornate Hawk-eagle	8	41
<i>Stephanoaetus coronatus</i>	Crowned Eagle		4
<i>Polemaetus bellicosus</i>	Martial Eagle	1	

### Family Sagittariidae

<i>Sagittarius serpentarius</i>	Secretary Bird	15	19
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### Family Falconidae

<i>Daptrius ater</i>	Yellow-throated Caracara		4
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Polyborus plancus	Common Caracara	17	43
Milvago chimachima	Yellow-headed Caracara	1	
Herpetotheres cachinnans	Laughing Falcon		3
Micrastur semitorquatus	Collared Forest Falcon	3	
Microhierax caerulescens	Red-legged Falconet	188	788
Falco naumanni	Lesser Kestrel		22
Falco sparverius	American Kestrel		12
Falco tinnunculus	Common Kestrel	46	15
Falco chicquera	Red-headed Falcon	21	30
Falco columbarius	Merlin	4	8
Falco subbuteo	European Hobby		3
Falco eleanorae	Eleanora's Falcon	1	2
Falco rufigularis	Bat Falcon	1	
Falco biarmicus	Lanner Falcon	2	36
Falco jugger	Laggar Falcon	30	364
Falco cherrug	Saker Falcon	1	2
Falco rusticolus	Gyr Falcon	7	29
Falco peregrinus	Peregrine Falcon	138	287
Unknown	Unspecified Raptors	44	109
	Total (Falconiformes)	789	2,527

## Order STRIGIFORMES

### Family Tytonidae

Tyto alba	Barn Owl	2	59
Phodilus badius	Bay Owl		1

### Family Strigidae

Otus asio	Common Screech Owl		3
Otus cooperi	Pacific Screech Owl		5
Otus barbarus	Bearded Screech Owl		4
Otus guatemalae	Vermiculated Screech Owl	7	3
Otus albogularis	White-throated Screech Owl	2	
Otus scops	Common Scops Owl		73
Otus bakkamoena	Collared Scops Owl		5

<i>Lophotrix cristata</i>	Crested Owl		9
<i>Bubo virginianus</i>	Great Horned Owl	7	6
<i>Bubo bubo</i>	Eagle-owl	32	4
<i>Bubo africanus</i>	Spotted Eagle-owl		1
<i>Bubo nipalensis</i>	Forest Eagle-owl		1
<i>Bubo sumatrana</i>	Malay Eagle-owl		1
<i>Ketupa ketupa</i>	Malay Fish Owl	6	2
<i>Ketupa zeylonensis</i>	Brown Fish Owl		2
<i>Scotopelia peli</i>	Pel's Fishing Owl		10
<i>Pulsatrix perspicillata</i>	Spectacled Owl	148	97
<i>Nyctea scandiaca</i>	Snowy Owl	8	1
<i>Glaucidium brasilianum</i>	Ferruginous Pygmy Owl	2	2
<i>Glaucidium passerinum</i>	Eurasian Pigmy Owl		29
<i>Glaucidium perlatum</i>	Pearl-spotted Owlet	7	6
<i>Glaucidium capense</i>	Barred Owlet	7	
<i>Glaucidium brodiei</i>	Collared Owlet		26
<i>Glaucidium cuculoides</i>	Cuckoo Owlet		1
<i>Athene noctua</i>	Little Owl		200
<i>Athene brama</i>	Spotted Owlet		48
<i>Speotyto cunicularia</i>	Burrowing Owl	8	16
<i>Ciccaba nigrolineata</i>	Black-and-white Owl		1
<i>Strix aluco</i>	Tawny Owl	3	
<i>Asio otus</i>	Long-eared Owl	3	
<b>Unspecified Owls</b>		<b>30</b>	<b>60</b>
	<b>Totals (Strigiformes)</b>	<b>272</b>	<b>676</b>

### Estimated Grand Totals of Birds of Prey Imported into the United States

	Falconiformes	Strigiformes	Total
1968	789	272	1,061
1969	2,527	676	3,203

**Discussion.** A return of 71% of surveys sent to one hundred and sixty-two Zoological Societies shows a total of 1,828 birds of prey on exhibition. There is evidence pointing to the larger species being popular for this purpose, particularly Eagles and Vultures. Buteos also form a firm nucleus. In respect to the replies of the surveys only one reference was



made to successful rearing of raptors in captivity—in this case, one White-tailed Sea Eagle.

One of the purposes of a zoological collection must be research endeavors; captive propagation must surely fall in this category. This is particularly true when speaking of a species such as the Philippine Monkey-eating Eagle (*Pithecophaga jefferyi*). With published figures of a total wild population of under forty-eight left (*Last Survivors*, Noel Simon) and with an equivalent zoological population in the United States of America alone of 17% of this total, zoological societies should be expected to participate much more strongly in research programs in many different directions, both on a national and indeed an international basis.

In the *Bald Eagle Project* (National Audubon Society, 1963) a total wild population of Bald Eagles (excluding Alaska) of 3,547 birds was projected. Returns from this survey show a total of 132 Bald Eagles on exhibition or 3% of the 1963 total; and of course, in many respects the picture has only become worse since the 1963 count was made.

Statistically if one expanded the total of 1,828 returns in this survey from 71% to 100%, a total of 2,574 would be arrived at. Whether in practical circumstances this is acceptable can be questioned, as it is felt most of the major societies did participate in the survey.

In the research areas the emphasis for investigation at this time appears to be concerned with the American Kestrel, Peregrine Falcon, and Bald Eagle. Breeding projects and pesticides investigation are being heavily researched. It is worthy to note here that much of the research being carried out concerning birds of prey is being instigated and perpetuated by private organizations and individuals, falconers playing a major role in a large portion of cases. Statistically if the total of 604 birds returned from 67.6% of the survey was expanded to 100%, a total of 893 birds would be arrived at. However, as mentioned before, such an expansion is questionable.

In the falconry total some interesting points came to light. It is estimated that 58% of all raptors worked with belong to the *Buteo* or *Parabuteo* genera and this percentage may well be too low. These birds are extremely common and if the majority of falconers are indeed working with this percentage then falconry cannot be considered being harmful to the continuance of the birds of prey. Twenty-eight percent, it is esti-

mated, work with falcons. Again, however, between 10% to 12% of this 28% is made up by the American Kestrel, a most common raptorial bird throughout the United States of America, the remaining percentage being spread over a fuller spectrum of falcons.

Importation figures demonstrate several points. First the total number of raptorial birds entering the United States in 1969 was approximately triple the total number of 1968. However, this vast increase can be practically explained on an individual species basis as demonstrated below (P—Pet; Z—Zoological; R—Research; F—Falconry).

### Some Individual Species Importation Totals

	1968	1969	Increase
Bateleur (Z)	3	24	21
Marsh Hawk (Z & P)	2	80	78
White-eyed Buzzard (P)	6	67	61
Steppe Eagle (Z)	16	28	12
Roadside Hawk (P)	44	175	131
Shikra (R&F)	30	126	96
Ornate Hawk-eagle (Z)	8	41	33
Common Caracara (Z)	17	43	26
Red-legged Falconet (P)	188	788	600
Lagger Falcon (F)	30	364	334
Peregrine Falcon (R&F)	138	287	149
Barn Owl (Z)	2	59	57
Common Scops Owl (Z&P)		73	73
Little Owl (Z&P)		200	200
<b>TOTALS</b>	<b>484</b>	<b>2,355</b>	<b>1,871</b>

The most severe increases noted are in raptors that are commonly utilized for the so-called pet trade. The species that this author would include under that heading carry a symbol "P" and as can be seen, the importation of the Red-legged Falconet has apparently increased 319% in one year. Considerable increases are also noted for the Roadside Hawk, the Little Owl and to a lesser degree, the White-eyed Buzzard and the Marsh Hawk.

The importation and sale of exotic or indeed any raptorial bird for pet trade purposes is to be condemned, and this author feels that steps should be taken immediately to prevent this commercialism expanding further.

It will be noted that the use of the Lager Falcon for falconry purposes appears to have increased sharply; however, it must be stated that importation lists are often confused between the Lager, Lanner and Saker Falcon and it is highly probable that figures shown for the Lager Falcon should be more evenly spread over the three species mentioned. Again for zoological purposes increases are noted in the larger raptors such as the Steppe Eagle, the Hawk-eagles and the Caracara. Importation figures are compiled by the Bureau of Sport Fisheries and Wildlife annually from Form 3-177 which must be filed with the U. S. Customs when foreign wildlife is imported. The amount of variance as recorded on these forms is in some cases incredible and it is to the credit of the Bureau of Sport Fisheries and Wildlife that any legitimate totals can be compiled. In this paper some differences will be noted in imported species compared to those recorded as being held for zoological, research or falconry purposes. There are several explanations for this as follows.

1. Zoological Society did not reply or did not partake in the survey.
2. Bird is held by dealer.
3. Bird was sold for pet purposes or to small travelling zoo or circus.
4. Research facilities did not reply or partake in the survey.
5. Bird held for falconry but not recorded.
6. Bird identified incorrectly.

On the other hand, however, it must be realized that in the majority of instances importation figures shown here are incorporated in the surveys earlier in this paper.

**Conclusions.** A series of surveys has been carried out to gather estimations of birds of prey in captivity in the United States of America. These surveys have included zoological, research, falconry, and importation sources. Replies indicate that there could well be a total of between 4,600/5,800 such birds being utilized or held for various reasons. The former figure of 4,600 is taken from this survey including approximately 1,000 birds imported for what is felt to be the pet trade, while the latter figure is an expanded 100% replies from this survey plus approximately 1,000 birds imported for the pet trade.

Other points of interest are:

A. An equivalent of seventeen percent of the estimated remaining wild population of the Philippine Monkey-eating Eagle are in various zoological collections in the United States of America and it is highly likely that on a worldwide basis an equivalent of at least sixty percent or more would be found in captivity.

B. Zoological societies can and should provide more experts to meet the challenges of, and to play more aggressive roles in, research endeavors.

C. The majority of zoological specimens are single birds; cooperation between various societies for research projects—particularly rare species—should be given immediate and serious consideration.

D. At least fifty Andean Condors are in captivity. The situation of this species in the wild should be carefully gauged and birds in captivity used not only for exhibition purposes, but also research efforts.

E. Over one hundred Peregrine Falcons are being held for research purposes; this total includes many different subspecies both native and exotic, most of which are in captive breeding projects or pesticide studies.

F. A considerable number of raptors are imported for pet purposes. This practice is to be condemned and immediate steps should be taken to prevent further growth of this commercial marketing.

G. Approximately 70% of all birds of prey worked with for falconry purposes in the United States would appear to be very common birds—*Buteo*, *Parabuteo*, and *Falco sparverius*—thus falconry in general does not play a detrimental role with regard to wild raptor perpetuation.

H. Falconers are deeply engaged in research efforts with birds of prey. Indeed one can say without hesitation that at this time they form the vast majority.

**Acknowledgments.** I wish to thank the many organizations and individuals who have made this survey possible. Included are: Division of Wildlife Research, B.S.F.W., many universities, zoological societies, private research organizations, state wildlife and natural resource agencies, falconers, researchers, and some animal import firms. To all of these go my sincere thanks for providing information so openly and with so much evident interest.

**RESEARCH PLANNING CONFERENCE  
ON PEREGRINES AND OTHER BIRDS OF PREY  
CORNELL UNIVERSITY, ITHACA, NEW YORK,  
NOVEMBER 7-9, 1969 – Part 2**

by  
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*Session of November 7, 1969 (continued)*

**Peregrine Falcons—Breeding Populations (continued)**

**Tom Cade (Upper Yukon River, Colville River, Alaska).** Table 2 summarizes Cade's data for the Upper Yukon River and the Colville River in Alaska since 1951. It is noted that in neither area is there any decline in the over-all number of occupied eyrie sites, but a definite decrease in reproductive success is evidenced. If we base a reproductive success on the number of fledglings per total pairs we observe a decrease from an average of possibly 1.25 in 1951 to an average of 0.93 in 1969 along the Yukon and a decrease from an average of 1.40 in 1952 to an average of 0.79 in 1969 along the Colville River. Probably the most meaningful parameter we can look at is the increase in unproductive birds: they increased from 36.3% in 1951 to 53.3% in 1969 along the Yukon River and from 34.4% in 1952 to 60.4% in 1969 along the Colville River. Probably the most distressing evidence of reproductive failure are the young between two and three weeks of age which were found dead at the nests for no explainable reasons as yet (10 collected, others decomposed). Weather was not felt to be the cause since the only unseasonable bad spell of weather did not occur until after the young had died. Coinciding with the deaths of these young was an increasing awareness of the breakdown of parental care for the young at these nests and in instances they were observed to not brood or feed young for long periods of time. One



**Table 2. Reproductive Data on Peregrines [T. Cade]**  
**A. Along the Upper Yukon River (172 Miles)**

Datum	1951	1966	1967	1968
Total number of pairs	16-19	17	15(min)	17
Unproductive pairs	ca.7/19 36.3%	3/17 17.6%	? —	8/15 53.3%
Eggs or downies/laying pairs (Average)	—	34/13 3.09	—	19/5 3.80
Nestlings/hatching pairs (Average)	—	—	32/13 2.46	14/7 2.00
"Fledglings"/successful pairs (Average)	20/12 1.67	27/12 2.25	—	14/8 1.75
"Fledglings"/total pairs (Average)	20/16-19 1.05-1.25	27/15 1.80	14/10 1.40	14/15 0.93
Total probably fledged	20	30	21-23	16

**B. Along the Colville River (183 Miles)**

Datum	1952	1959	1967	1968	1969
Total number of pairs	32	36	27	32	33
Unproductive pairs	11/32 24.4%	33.0%	9/27 33.0%	16/32 50.0%	20/33 60.6%
Eggs or downies/laying pairs (Average)	54/17 3.18		40/18 2.22	50/18 2.78	76/26 2.92
Nestlings/hatching pairs (Average)	56/21 2.67		—	—	—
"Fledglings"/successful pairs (Average)	35/14 2.50		34/18 1.89	34/16 2.13	26/13 2.00
"Fledglings"/total pairs (Average)	35/25 1.40		34/27 1.26	34/32 1.06	26/33 0.79
Total probably fledged	44		34	34	26 or less

young observed in the process of dying was not being brooded at all by the parents. It was hypothesized that altered steroid physiology due to the effects of pesticides could perhaps in turn affect parental behavior in this way.

In general, data available since 1951 and 1952 up until 1969 indicate there is no reduction in numbers of pairs of falcons along the Upper Yukon River and Colville River, and



it is postulated that even though reproductive success has been significantly decreased, production of young is still adequate to balance loss of adults from the population.

Pesticide levels and egg shell indices from eggs collected in these areas of Alaska are presented in Table 4.

**Gerald Swartz (Interior, Alaska).** Dr. Swartz presented data based on 8 known traditional Peregrine sites in interior Alaska. In 1969, 7 of these eyries were occupied, but only one was known to have hatched eggs; one other pair abandoned eggs after two weeks. The successful nest fledged 4 young, and in 1966 from the same site 2 young were fledged. The possibility of weather being a widespread cause of reproductive failure in interior Alaska was raised since it was an extremely dry year with no rain between February and August. These dry conditions also led to extremely severe fire and smoke conditions over much of this area for much of the summer, and the effects of this on hunting ability and behavior of the adult falcons can only be guessed at.

**Clayton M. White (Aleutian Islands, Alaska).** [This section is an abstract prepared by C. M. White in 1970—Ed.] This reports the first detailed study of Peregrines in the Aleutian Islands, Alaska. The studies were made on Amchitka Island which is situated in the North Pacific between 51 and 52°N Latitude and is an island of treeless tundra. This report outlines my data from May to July 1969, January 1970 and May-June 1970, observations by other investigators recently on the island, and specific observations on Amchitka from older literature.

Fifteen pairs and two apparently unmated adults defended territories. Mean distance between pairs was about 5.3 straight-line miles. Nesting success could be determined at only 11 eyries in 1969. I have no data for the other four pair. Fledging success for the 11 eyries was about 1.36 per nest. In seven nests, examined during the incubation period, clutch size averaged 3.14 eggs. Most observed nesting mortality was apparently caused by human activity. Fledging began near the end of June and there was near synchrony in fledging dates. Where nest loss occurred there were no re-nesting attempts.

About 75% of the prey taken, May through July 1969, was small alcids of five or perhaps six species. Land birds

become more common as prey shortly before fledging and on into the fall.

Perhaps most of the birds remain on the island through the winter. On 10 January 1970 on a 53 straight-shore line mile flight pairs of adults were found at 3 eyries and 7 sub-adults were counted. On 20 January 1970 on 109 mile flight 13 adults (8 eyrie sites occupied by at least one adult) and 5 sub-adults were counted.

The 1970 nesting season showed 19 sites occupied by adults and of 12 sites climbed there were 40 eggs or young for an average of 3.3 items per nest. I had to leave the island before data of fledging could be obtained.

Extrapolations from Amchitka population density, from ecological variables of Amchitkan and other marine Peregrine populations, and from the physiography of the islands could suggest that 300 breeding pairs inhabit the Aleutian chain.

**Steven Herman (Interior, California).** No birds were found at 18 sites which were checked. From other sources and rumors there may have been another 5 known occupied sites, and probably at least 3 pairs laid eggs. One adult bird was known to have died at an eyrie, and an immature female which appeared to be of the subspecies *F. p. pealei* was shot in late July in northwest California.

**Robert Risebrough (Coastal, California).** Probably the best known Peregrine eyrie in California is located at Morro Rock. Up until 1967 the young birds were always taken by falconers but from 1967 on the eyrie was closely watched by the Audubon Society. In 1967, 2 young were fledged and in 1968, 3 young were fledged. On Easter Sunday, 1969, the female was found dead and the immediate cause of death was determined to be a prolapse of the oviduct. It was interesting to note that despite the coastal situation of this eyrie, all prey species were determined to be land birds, including Mourning Doves (*Zenaidura macroura*), Yellow-billed Magpies (*Pica nuttalli*), and passerines.

**[Robert Risebrough (Baja California).** An egg was collected in 1967 with 500 ppm net weight of organochloride residues. In 1968 (nearby site) one egg was hatched and fledged from this nest. The egg shell was 39% thinner than previous shells. In 1969 at the original site there was one small egg

lacking a yolk. Also the same year 22 adults and one immature were seen, seven eyries found, and at least three young fledged.—Ed.]

Pesticide levels and egg shell data from material collected in California and Baja California are presented in Table 4.

**James Enderson (Rocky Mountain Region).** Thirty-six out of 50 eyries known in Arizona, New Mexico, Colorado, Wyoming and Montana were visited in 1969 and 10 sites were found occupied. Eight sites were successful in producing 11 downies, and 4 were known to fledge. One Colorado site was not re-checked to determine if young were produced.

**Clayton M. White (Utah).** Two active eyries were observed in Utah in 1969: at one at least 1 young was raised; at the second a pair of adults was observed.

**Joseph Hickey (European populations).** Table 3 summarizes reproductive data on French Peregrines. In Switzerland all but 1 of 15 eyries were deserted.

In Great Britain 1969 data were not available, but a general southward trend of reoccupation has occurred since the banning of chlorinated hydrocarbons.

In Ireland the situation is reported to be getting worse, coinciding with no reduction in the use of Dieldrin, DDT, etc.

No data are available from Finland, Germany, or Spain.

### *Peregrine Falcons—Migrant Populations*

**Robert Berry (Assateague Island, Maryland).** For many years Assateague Island has been known to falconers and others as an area where migrant tundra Peregrines could be trapped in numbers, and in past years an average of 37 birds per year have been taken. In 1968, 30 birds were trapped, and in 1969, 34 birds were captured. In 1969 a total of 146 trapper days were spent on the beaches between September 24 and October 18, and 161 sightings of Peregrines were made. The adult to immature ratio was less than 1:5, or approximately 17% adult.

**Table 3. French Peregrine Data from Jean-Francois Terrasse  
25 October 1969**

**A. Status at 146 territories visited in 1968.**

Region	Bourgogne	Jura	South of Massif Central
Ecology	Near important cultivation	Not far from cultivation	Very poor agriculture
% of territories			
Deserted	17.5	20	0
Single bird	29.5	23	16.7
Pair	53	57	83.3
Pair with young	17.5	32.7	66.7
Young per pair	1.66	1.93	2.70

**B. Trend in Jura Mountains (66 territories known).**

Year	1967	1968	1969
Number visited	57	61	61
Deserted	7	12	21
Single Adult	11	13	18
Single Immature	0	1	3
Pairs (Adult + Immature)	0	1	1
(Both Adult)	39	34	18
With young	25	20	7
Young per eyrie (per pair?)	2.0	1.93	1.66

**James Enderson (Texas Gulf).** Comparisons were made between 1964 and 1969 on the number of birds seen while driving the beaches, with an average of 4.9 birds per 100 miles travelled on the beaches and 4.7 birds per 100 miles in respective years. In 1964 the adult to immature ratio of 1:1.38 based on 38 birds was almost twice the ratio of 1:0.64 for 1969 based on 36 birds.

**Daniel Berger (Cedar Grove, Wisconsin).** Twenty years data at Cedar Grove have indicated approximately a 30% drop in numbers of Peregrines sighted from 1953 to 1967, based on five-year running averages to overcome weather differences.

It was stressed that one must keep in mind that there are many variables which can affect such data, including weather, different observers, etc. In 1969 there were 9 adults, 7 immature, and 3 undetermined. A 54% drop in the numbers of Merlins was also noted.

**Noel Snyder (South Florida).** Snyder reported initiating a new 35-mile survey route in November 1949.

### *Discussion*

Following the presentation of papers on the Peregrine Falcon, a discussion led by Dr. Hickey ensued in which the subject of pesticides and PCB's was dealt with. Table 4 presents the levels of pesticides and egg shell indices given by workers with material from their area analyzed.

Dr. Hickey indicated that an over-all reproductive success of North American Peregrines based on the papers presented was about 1.0 young per occupied site, and a need for more early season data was indicated. He also indicated that residue levels in some areas are relatively low and cannot be correlated with population troubles as yet.

The most reliable parameter for estimating the effects of pesticides (plus PCB's) on the reproductive potential of Peregrines seems to be at present the egg shell index used by Ratcliffe in Great Britain. Correlation between indices and amounts of DDT and DDT derivative residues have been shown in Herring Gulls (Keith), Double-crested Cormorants and White Pelicans (Risebrough), Bald Eagles (Sprunt), and Prairie Falcons (Fyfe). A 19% reduction in egg shell thickness based on indices seems to be critical in the Peregrine. Indications are that at least in northern Canada, interior Alaska, and in California, populations are probably beyond the critical stage where this thinning begins to affect reproductive success, being 21.7% and 34% respectively (Table 4).

The problems of PCB's have only begun to be explored, but there are suggestions that their effects are about equivalent to that of DDT and its derivatives. R. Risebrough indicated that the ratio of DDT to PCB's in San Francisco Bay ranges from about 1:1 near shore to 1:10 far out. DDT:PCB ratios in Pacific coast birds are given as 16 in Slender-billed Shearwaters (*Puffinus tenuirostris*) and 6 in the Ashy Petrel (*Oceanodroma homochroa*), while those for Atlantic coast



**Table 4. Pesticide and Egg Shell Data**

<b>T. Cade</b>	<i>Pre-1947</i>	<i>Post-1947</i>	<i>Thickness Reduction</i>
<b>Peregrines</b>			
<i>Interior Alaska</i>			
Egg Index	1.79(N=20)	1.49(N=11)	16%
DDE(ppm dry)		106 (N=11)	
<i>Arctic Alaska-Canada</i>			
Egg Index	1.89(N=18)	1.48(N=23)	21.7%
DDE(ppm dry)		194 (N=11)	
<b>Rough-legs</b>			
Egg Index	2.16(N=48)	2.08(N=16)	8.4%
DDE(ppm dry)		4.40	
<b>J. Enderson</b>			
<i>Arctic Alaska</i>		DDE(ppm wet), Peregrine biopsy fat	
<i>Mackenzie River</i>		599 (N=9)	
		1262[?Ed.]	
<b>R. Fyfe</b>		DDE(ppm wet), Peregrine Eggs	
<i>Barrens</i> 1966		4.35(N=6)	
1967		7.98(N=4)	
1968		21.75(N=1)	
<i>Ungava</i> 1967		13.31(N=10)	
<i>Q.C.I.</i> 1966		6.77(N=2)	
1968		22.83(N=1)	
<b>C. M. White</b>	<i>Pre-1947</i>	<i>Post-1947</i>	<i>Thickness Reduction</i>
<i>Aleutians</i>			
Egg Index	1.92(N=30)	1.74(N=6)	6%
Egg Weight	4.23(N=30)	3.96(N=6)	6.4%
DDE(ppm dry)		25.1(N=6)	
DDE(ppm wet)		3.8 (N=6)	
<b>R. Risebrough, California and Baja California</b>			
<i>Morro Rock</i>		Female Peregrine, DDE (of lipid content) (fat basis) 700 ppm (subcutaneous fat, 1000 ppm), PCB 300 ppm (subcutaneous fat 400 ppm)	
<i>Baja</i> 1967–		DDE 5 mg/100 mg sample? 1 egg	
1968–		from egg remnants 34% thinning from pre-war average	
1969–		1 egg–pre-war thickness average 34, post-war thickness .29, DDE 388 ppm, Dieldrin 13.4 ppm, PCB greater	
		1 egg–post-war thickness .28	



birds are given as 0.86 for Leach's Petrels (*Oceanodroma leucorhoa*), 0.29 for Wilson's Petrels (*Oceanites oceanicus*), and 0.68 for Audubon's Shearwater (*Puffinus lherminieri*). This would indicate a much heavier contamination of the Pacific coast with PCB's than the Atlantic coast.

Short talks were given on the physiology of egg shell thinning by R. Risebrough and L. Stickel. One of the puzzling aspects of this thinning process is that only a small amount of DDE and/or PCB is required to cause an initial substantial decrease; greater amounts of these chemicals then cause only a much decreased rate of thinning. By the time levels of DDE have reached 2500 ppm the egg shell thickness has decreased to where there is little more than egg membrane left. Most recent evidence suggests that the calcium must be hit at some sensitive site involved with enzymes, perhaps at the point where calcium is absorbed by the gut. This absorption involves active transport by certain membrane proteins, and it has been shown that DDE can affect these proteins. Vitamin D is also considered to be essential in this active transport. Another possible sensitive site is the calcium pump of the shell gland where a calcium binding enzyme is found which is affected by DDT. This enzyme is usually found in excess though; therefore small amounts of DDT would probably not cause a rapid change in egg shell thickness via this pathway. Another enzyme induction theory is concerned with the effects of pesticides on hepatic enzymes somehow involved in calcium metabolism. Needless to say, much work has yet to be done on this subject.

The discussion period closed with the decision that if possible a continental-wide Peregrine Falcon survey should be undertaken every five years beginning in 1970. R. Fyfe was to be responsible for Ungava, the Maritimes, Ontario, S. Quebec, Alberta, S. Baffin Island, Interior Barrens, District of Mackenzie, Yukon Territory and the Queen Charlotte Islands or as much as could be feasibly handled; T. Cade was to be responsible for the Aleutians, arctic Alaska, and interior Alaska; S. Herman and J. Enderson were to be responsible for California, Washington, Oregon and the Rocky Mountain region; and M. Kirven was to be responsible for Baja California and Mexico. The details of this survey were to be worked out in later discussions.

*(This report will be continued.)*

## **SEX DETERMINATION IN BIRDS OF PREY BY LAPAROTOMY**

by

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Many problems are encountered in breeding projects involving birds of prey, not least is knowing that one does have a male and female. Most of the successful breeding experiments have been done with American Kestrels. Since these birds are sexually dimorphic, pairing them has been relatively simple. The larger hawks and falcons, however, are sometimes very difficult to sex by external characteristics. The main criterion that most people go by is size difference, the female usually outweighing the male considerably. Notwithstanding, even the most experienced ornithologists and falconers must admit that there are weight overlaps in both sexes.

Admittedly, if one has observed his bird in nesting activity he can be sure of sex by behavioral characteristics. On the other hand, if wild trapped birds are being used for breeding, sexing is almost impossible. We were faced with this problem in our current breeding project with Red-tails. Two adult Red-tails were trapped at random and according to body weight and foot size both were males. The birds weighed 37 and 38 ounces and there was no difference in foot size.

We decided to perform an exploratory laparotomy and examine the gonads macroscopically to determine sex. We found the 37 ounce bird to be a male and the other a female.

The surgical technique is relatively easy. The same approach is used as in caponizing roosters. The poultry people use no anesthesia and do not suture the abdomen. The estimated mortality rate in their procedure is about 1%. We do

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not boast that there is no risk in this procedure with birds of prey, but if done properly the mortality rate should be close to zero. We have performed laparotomies on about 30 birds of various species and have lost none.

Anesthesia can be accomplished by using gaseous or parenteral anesthetics. Our anesthetic of choice is halothane, which is a volatile anesthetic and requires a gas anesthetic machine. The only parenteral anesthetic we recommend is Equi-Thesin which is usually injected intramuscularly. The dosage is 0.20-0.25 ml. per 100 grams of body weight (Gaudal, 1969). The weight-dosage relationship is very critical when using any parenteral anesthetic since a slight overdose may kill the bird. In view of this danger, it is very important that the bird be weighed accurately and the dosage calculated accordingly.

In our procedure we induce anesthesia by placing a cone connected to the gas machine over the nares and mouth of the bird. The halothane vaporizer is turned to 5%. In using a cone for induction, halothane vapor may get into the eyes causing a keratoconjunctivitis. We recommend that 2-4 drops of a suitable wetting agent be placed in the eyes before coning which should prevent damage to the cornea. Ideally, a cone should be fashioned that prevents exposure of the cornea.

When the bird's eye lids close and the mouth can be opened with relative ease, one should be able to pass an endotracheal tube into the larynx. For a bird the size of a Red-tail we use an appropriate sized cat endotracheal tube that is commonly used in veterinary surgery. After the bird is intubated the anesthetic vaporizer is turned down to about 1.5%. This is a relative percentage and will vary with different machines and even individual birds.

Anesthesia is monitored by respiration rate, color of mucous membranes, and heart rate. These parameters, of course, vary with different species of birds which the anesthetist must determine at the time of surgery.

Once surgical anesthesia is reached, the bird is placed on its right side. In most birds of prey, except accipiters, only the left ovary develops. After the bird is secured to the operating table, the down feathers are plucked from an area in front of the thigh about the full length of the thigh and half as long.

A skin incision is made over the sartorius muscle. The skin is incised starting ventral to the ilium distally to about mid-

way down the thigh. Hemostasis is usually no problem and is controlled easily by digital pressure with a 4x4 gauze sponge. The subcutaneous tissue is bluntly dissected until a blunt type retractor can be placed under the sartorius muscle. The entire thigh is retracted posteriorly exposing the 7th and 8th intercostal space.

An incision is then made in the intercostal muscles large enough to insert an otoscope speculum which is used to examine the gonad. The otoscope handle is placed on the speculum permitting one to view the abdominal organs.

The abdominal air sac is the first structure seen once in the abdomen. Occasionally the air sac is cut when the intercostal muscles are incised. This is really no problem since the air sac can be sutured with 4-0 chromic gut at the end of the procedure. The posterior border of the lung is then located by directing the speculum slightly antero-dorsally over the air sac. Lying just caudal to the lung is the anterior lobe of the kidney. The adrenal gland, a bright yellow structure, can be seen at the anterior medial border of the kidney. The gonad is located just ventral to the anterior lobe of the kidney. The ovary appears as a cluster of grapes, the grapes of course representing follicles. The color of the ovary is light yellow to white.

The testicle is elongated in shape and is quite pendulous and large when the bird is in season, but will be very small and more closely adhered to the kidney and adrenal gland if the bird is in refracton. The color of the testicles in the birds of prey we have examined was light yellow.

Once identification of the gonad has been made, one proceeds with closure. As mentioned earlier the air sac if incised can be closed with 4-0 chromic gut. The intercostal space can be closed with 1-0 gut, usually one or two interrupted sutures placed around the anterior border of the 7th rib and posterior border of the 8th is sufficient. The skin incision is closed with 3-0 chromic gut using a simple continuous suture pattern.

Since avian body temperature is relatively high, gross bacterial contamination of the wound is unlikely. No post-operative complications following this procedure should be expected as long as the bird is well cared for.

The down feathers that were plucked from the surgical site will grow back within 6-8 weeks. It is also cosmetically

acceptable, since the longer breast feathers and wing will cover the incision.

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